

**Remarks**

Examiner Pham is thanked for the thorough Office Action.

**In the Drawings**

Applicant acknowledges the objection to the drawings vis a vis the die perimeter reference sign "102" described on page 9 of the specification not being shown anywhere in any of the Figures.

The amendments to the third and fourth paragraphs on page 9 of the specification obviate this objection to the drawings by deleting "102" at each instance.

**In the Specification**

Applicant acknowledges the Examiner's objection to the title of the invention as filed as not being descriptive.

The title of the invention has been amended in a manner believed to make the title descriptive of the invention. No new matter has been added.

Even though Applicant respectfully disagrees with the Examiner's assertion that those skilled in the art would not be able to determine the die perimeter from the Figures as filed, the third and fourth paragraphs on page 9 of the specification as filed have been amended to delete the reference sign "102" at each instance to obviate the objection to the drawings.

### **In the Claims**

Independent claims 1, 24 and 46 have been amended to include the limitation that "at least one of the one or more pillar structures having a lower lead-free portion and a coextensive upper solder material portion".

Dependent claims 10, 32 and 55 have been amended to delete the number "100" which was a typographical error. The scope of claims 10, 32 and 55 have not been narrowed by these respective amendments.

Claims 14, 15, 17, 18; 36, 37, 39, 40; 59, 60, 62, 63 have been canceled to conform to the amendments to respective independent claims 1; 24 and 46.

Claims 16, 19 to 22; 38, 41 to 44; 61 and 64 to 67 have been amended to conform to the amendments to respective independent claims 1; 24 and 46.

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Claims 69 to 71 are new and have been added to better encompass the full scope and breadth of the invention notwithstanding the patentability of the original claims and depend from independent claims 1, 24 and 46, respectively.

**Claim Objections**

**The Objection to Claims 10, 32 And 55 Because of the Following Informalities: “100” should be deleted.**

The objection to claims 10, 32 and 55 because of the following informalities: “100” should be deleted is acknowledged.

Claims 10, 32 and 55 has been so amended. These respective amendments have not narrowed the scope of these claims.

**The Objection to Claims 16, 19, 20, 38, 41, 42, 61, 64 And 65 Because of the Following Informalities: “comprised of ... or” Should Be Deleted, -- consisting of ... and -- Are Inserted Instead.**

The objection to claims 16, 19, 20, 38, 41, 42, 61, 64 and 65 because of the following informalities: “comprised of... or” should be deleted, -- consisting of ... and -- are inserted instead is acknowledged.

Applicant respectfully disagrees with the Examiner’s position that “comprised of...or” must be replaced with -- consisting of... and --. While Applicant agrees the use of “comprised of ... and” is not an acceptable method of Markush Group

claiming, the Applicant's instant use of "comprised of ... or" is not an attempt of Markush Group claiming but is a form of the acceptable "'Or' Terminology" discussed in MPEP 2173.05(h) II.

Thus, claims 16, 19, 20, 38, 41, 42, 61, 64 and 65 have not been amended in relation to this objection.

### **Claim Rejections**

#### **The Rejection Of Claims 1, 2, 11 To 19, 24, 31, 33 To 41, 46, 47, 54, And 56 To 64 Under 35 U.S.C. §102(b) As Being Anticipated By Kondoh et al. (U.S. Patent No. 5,448,114)**

The rejection of claims 1, 2, 11 to 19, 24, 31, 33 to 41, 46, 47, 54, and 56 to 64 under 35 U.S.C. §102(b) as anticipated by Kondoh et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) is acknowledged.

#### **The Rejection Of Claims 3 To 8, 10, 20 To 23, 25 To 30, 32, 42 To 45, 48 To 53, 55 And 65 To 68 Under 35 U.S.C. §103(a) as Being Unpatentable Over Kondoh et al. (U.S. Patent No. 5,448,114) As Applied To Claims 1, 2, 11 To 19, 24, 31, 33 To 41, 46, 47, 54, And 56 To 64 Above, And Further In View Of The Following Reasons.**

The rejection of claims 3 to 8, 10, 20 to 23, 25 to 30, 32, 42 to 45, 48 to 53, 55 and 65 to 68 under 35 U.S.C. §103(a) as being unpatentable over Kondoh et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) as applied to claims 1, 2, 11 to 19, 24, 31, 33 to 41, 46, 47, 54, and 56 to 64 above, and further in view of the following reasons is acknowledged.

Applicants' wish to briefly point up the claimed features of their invention which are believed to be not shown nor obvious from the teachings of known references in this field. The claims all clearly define: (1) a die comprising a substrate and one or more "pillar structures" (within the meaning of the disclosure of the instant specification and Figures) formed over the substrate in a pattern wherein at least one of the one or more pillar structures having a lower lead-free portion and a coextensive upper solder material portion; and (2) a method of forming such a die.

The '114 Kondoh Patent discloses the combined use of bumps 4 and a wall member 3, each generally made the same solder material in most of the Kondoh embodiments, formed on a chip electrode and frame-shaped electrode so that when the chip and a circuit board face each other, a heat treatment is performed to simultaneously connect the bumps 4 and wall member 3 to the board by reflow. This permits the wall member 3 to suppress the thermal expansion of the circuit board and absorb thermal stress instead of the bumps 4. Col. 7, lines 10 to 12.

The fourth embodiment of Kohdoh (Col. 12, line 50 to Col. 14, line 13) discloses the wall member 3 being made of a gold-plated copper or other metals with some heat conductivity (Col. 14, lines 7 to 11), this embodiment describes “[a] CCD chip 101 [is] connected via bumps 4 to a glass board 102...” with “[a] wall member 103 ... obtained by forming a gold-plated layer on a copper pattern [is] bonded to both of the surface of the CCD chip 101 and that of the glass board 102 so as to enclose a pixel area 105” (sic) (Col. 12, lines 54 to 61).

Independent claims 1, 24 and 46 each recites “at least one of the one or more pillar structures having a lower lead-free portion and a *coextensive* upper solder material portion” (emphasis added). This language distinguishes over Kondoh under §102(b) because Kondoh does not show disclose, or fairly teach, such two layer coextensive (pillar) structures. The bumps 4 and wall member 3 of Kondoh are either both formed of a solder material or the wall member is formed of a gold-plated copper or other metals with some heat conductivity.

Applicant respectfully disagrees with the Examiner’s interpretation of Kondoh at page 4 of the instant office action re claims 16-19, 38-41 and 61-64.

Specifically, Applicant urges that Kondoh does not teach or fairly disclose that “the one or more pillar structures are comprised of ... a lower copper layer and a coextensive overlying reflowed solder layer (col. 11, lines 61-62)...” The Examiner has interpreted Kondoh to teach/disclose that bumps 4 and wall member 3 are equivalent to the pillar

structures 34 of the instant invention and Kondoh discloses at Col. 11, lines 61 to 63 in reference to its second embodiment "[f]inally, as shown in FIG. 6E, a wall member 3 and a bump 4 made of solder are formed by electroplating." Thus wall member 3 and bump 4 does not include "a lower copper layer" as stated by the Examiner. In this embodiment, "because the bump [4] and wall member [3] are made of the same solder material, there is theoretically no possibility that thermal expansion due to temperature change causes vertical distortion." (Col. 11, lines 11 to 15) (which specifically discusses the first embodiment but since this second embodiment just uses a general-purpose semiconductor chip instead of a semiconductor chip dedicated for a semiconductor device as in the first embodiment, Applicant urges this quote applies equally to the second embodiment).

Applicant presumes that the Examiner has interpreted Kondoh at page 4 of the instant office action to teach/disclose a "lower copper layer" as the "frame-shaped pad 6 of titanium-copper laminated structure...". However pad 6 is: (1) not a part of overlying wall member 3 and; (2) does not function in conjunction with wall member 3 as disclosed by Kondoh and discussed above. Further, the layer underlying bump 4 ("lower copper layer") in Fig. 6D is actually "a rearranging wire 12 ... obtained by laminating titanium and copper in that order." However rearranging wire 12 is not, inter alia, coextensive with bump 4 as is now required by the amended independent claims in the instant claimed invention.



Dependent claims 3 to 8, 10, 20 to 23, 25 to 30, 32, 42 to 45, 48 to 53, 55 and 65 to 68 (and claims 69 to 71) distinguish over Kondoh under §103(a) because Kondoh does not disclose or fairly teach pillar structures having a lower lead-free portion and an upper solder material portion. Further, inter alia, the prior art lack a suggestion that Kondoh should be modified in a manner required to meet the claims; the Examiner has misunderstood Kondoh and the Examiner has made a strained interpretation of the reference that could be made only be hindsight.

Therefore claims 1 to 13, 16, 19 to 35, 38, 41 to 58, 61 and 64 to 71 are submitted to be allowable over the cited references and reconsideration and allowance are respectfully solicited.

### CONCLUSION

In conclusion, reconsideration and withdrawal of the rejections are respectively requested. Allowance of all claims is requested. Issuance of the application is requested.

It is requested that the Examiner telephone Stephen G. Stanton, Esq. (#35,690) at (610) 296 - 5194 or the undersigned attorney/George Saile, Esq. (#19,572) at (845) 452 - 5863 if the Examiner has any questions or issues that may be resolved to expedite prosecution and place this Application in condition for Allowance.

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Respectively submitted,

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke, positioned above a solid horizontal line.

Stephen B. Ackerman  
Reg. No. 37,761